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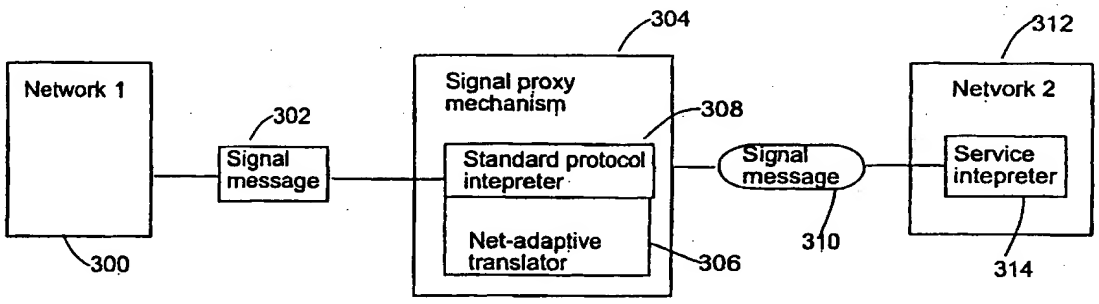

(57) Abstract

A device and system provide a simplified way to manage and use services produced in a first communication network for use in a second communication network. A signal proxy mechanism is disposed within a communication link between the first communication network and the second communication network. The signal proxy mechanism receives a signal message from the first communication network, where the signal message is formatted in a standard joint protocol. The signal proxy mechanism then converts the content of the signal message into a protocol that is native to a second protocol to which an outgoing message is sent from the signal proxy mechanism. Accordingly the second communication network need not perform a translation of the signal message it receives.

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TITLE OF THE INVENTION

DEVICE AND METHOD FOR SIMPLIFIED MANAGEMENT OF SERVICES IN A COMMUNICATIONS NETWORK

CROSS-REFERENCE TO RELATED APPLICATIONS

The present document contains subject matter related to that disclosed in two copending, commonly owned patent applications, the first of which being entitled "Method, System and Device for Establishing Communication Between Different Communication Networks", filed on the same day as the present document, and bearing attorney docket No. 2867-0162-2 PROV, having as inventors, Jan Arwald et al, and a second patent application entitled "Communication Network Service Management Method and Device", being commonly owned and filed on the same day as the present document, and bearing attorney docket No. 2867-0164-2 PROV, having common inventorship as the present document, namely Nyckelgard and Bjorkner, the entire contents of both of these documents being incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention is directed to methods and devices for enabling communication between different communication networks. More particularly, the present invention is directed to various communication systems including telecommunication systems, which may be offered by a variety of different conventional telecommunication providers, as well as non-traditional providers that provide different services on constituent components.

Discussion of the Background

During the information age, communication services and the infrastructure for providing communications has become a commodity. As the information age progresses, significantly more communication services are offered in various forms, each of which having various attributes and servicing different niche audiences. While in most countries the communication infrastructure, at least for telephony, has been established at one time or

another by way of a government corporation, or government condoned monopoly, at least at some basic level telephony-based networks are somewhat compatible. However, as more services become available, such as cable television, wireless satellite links, proprietary wireless local loop,Internet and other terrestrial-based networks. These are an increasing number of protocols and physical components needed to support those services. To the extent it is possible for the different communication networks to provide and share information between the different networks, perhaps by way of a caller request, or data message sent from one network to the next, the burden is on each of the different networks to provide a customized connection to the other networks. This is illustrated in Figure 1, where it is seen that different networks, such as GSM 1, ISDN 3, public switch telephone network (PSTN) 5, cable-TV 7, electrical service 9, Ethernet, 11, and Internet protocol (IP) 13 network each provide individual connections between themselves in a "spaghetti-like" fashion. Consequently, in order to provide connections between the respective networks, the network connections are made directly, thus requiring many translation devices and adapters for each network.

As presently recognized, a limitation with this point-to-point interconnection approach for existing network services, is that every time a connection is required between the different networks, every network must be provided with a new adapter so as to be compatible with the new network. Adding the adapter is a straightforward process from a planning perspective, but implementation is very difficult and cost increases significantly every time a new service is brought on line. Furthermore, such a system provides a barrier-to-entry for smaller proprietary networks that may ultimately bear the burden of funding the expense of updating the adapters for other existing communication systems.

Within the telecommunications world there are operators who have long offered telecommunication services within limited geographical areas. However, there are also new telecommunication operators, and other operators that provide an opportunity to provide telecommunications and other communication services which may be compatible, or even competitors with conventional telecommunication networks. For example, some of the new tele-operators include electrical distributers, cable TV operators, Internet providers, wireless services such as LMDS, etc. Originally, these different "nets" each served different purposes, and were not configured to work with each other since their services were in different topical areas. However, given the significant event of deregulation of the telecommunications

markets in the United States and in various other countries, it is presently envisioned that a transformation will occur on a global scale regarding the use of "non-conventional" resources to provide communication services. It is presently recognized that while these different services may be available, in order to have a commercially viable system that offers the consumer (i.e., subscriber, with commercially valuable service that truly allows the subscriber to have worldwide communication freedom regardless of where the subscriber presently is and plans to be in the future) point-to-point translators or gateways are being viewed as the solution. According to the configuration shown in Figure 1, it is up to the different systems themselves to work out the differences in protocols and communication capacities so as to establish communications between the "unconventional" communication providers, if in fact the communications link can be established at all.

In view of the evolution of communication networks in the present deregulation era, the present inventors have recognized that the conventional point-to-point approach towards connecting different networks, will necessarily provide an economic barrier to new services that wish to enter the communications arena, because as each new service comes on line, additional translation and adapter equipment is required for all of the other systems. .

As presently recognized, each of the different nets have one feature in common: each net communicates information from one point to the next. When it comes to communicating between different networks, language barriers (protocol differences) present themselves, which must be overcome in order to share the resources available between the different networks. The communication protocols, are not unlike different European languages. For example, more often than not incompatible "native" languages are not an absolute barrier due to the diversity of language skills held by many people. For example, as presently recognized, while it is possible that when one person approaches another person and begins communicating in language A, the second person will instantly be able to understand and converse in that language so that seamless communication may be had. However, often it is the case that when the first person begins communication with the second person in language A, but the second person recognizes that communication is not possible, and tries to respond with language B, hoping that the original speaker will be able to speak language B. Using this ping-pong approach, the two people eventually reach a determination regarding whether or not there is any common language that may be spoken between the two. When a common language is identified, the two may communicate directly, however, if there is no common

language between the two, then it will be necessary to use a translator (a third person) in order to allow for the two to speak with each other. The present invention, to some extent, leverages on this concept, and provides a central facility that helps facilitate in a fast and efficient manner different communication protocols that may be common between the two different networks so that those networks may operate in a direct communication mode. However, when communication is not possible the central facility provides an infrastructure for converting between the two languages (a translation function). Furthermore, the central facility helps educate both the first network and the second network, for future communication sessions, by efficiently providing to the different communication networks attributes of specific subscribers and networks that are used in the overall communication system.

As presently recognized, a limitation with the conventional approach is shown in Figure 1 for communicating between different networks, is that each of the different networks must be capable of supporting the different protocols of other networks to which interconnection is to be made. As a result, when exchanging information between the different nets, the different nets must be capable of managing a large number of protocols and be able to be fluent in translation between the different protocols so as to be able to handle the different service requests made by subscribers in another network that wish to use the services of a current network. As previously discussed, one of the limitations with this approach is that all of the networks are adversely affected when a new service (such as new service 15 shown in Figure 1) is added to the overall communication infrastructure. In addition to simply supporting the large number of different protocols in each of the networks, management of the protocols within the different nets will become increasingly difficult with time.

One approach toward resolving the issue of handling the large number of protocols for interconnecting different networks, is illustrated in Figure 2. In Figure 2, a first network 20 has a subscriber that wishes to employ the services of a second network 28. Instrumental in providing a protocol translation function between the first network 20 and the second network 28, is the inclusion of a gateway 24, such as a CVX-SS7 gateway offered by Nortel. The function served by the gateway 24 is to receive a signal message 22, provided from the first network 20, in the native protocol employed by the first network 20. The native protocol for the first network 20, is indicated by the oval shaped signal message 22. The gateway 24

then receives the signal message 22 and implements a "transparent changeover" for the signal message between the protocol employed by the first network 20 into that of the second network 28, at least for the lower level layers of the protocol employed by the second network 28. Moreover, the gateway 24 replaces the protocol levels between the first networks protocol and the second networks protocol during the session level in the OSI-stack, i.e., layer 5 as explained in Figure 15.10 of Stallings W, "Data and Computer Communications", 5th ed., Prentice-Hall, 1997, the entire contents of which being incorporated herein by reference.

While the OSI-stack is presently referred to, the gateway 24 can handle other protocols, and the replacement of the protocol levels during the session level in the OSI-stack, occurs at an equivalent location for the other protocol stacks. However, the protocol messages on the session level and higher levels remain unaffected and thus are transported directly to the second network 28. This is explained in Figure 2 by the partitioning of the message output from the gateway 24, showing the upper level protocol elements of the message 25, and the lower level elements of the protocol message 26. The lower level layers 26 of the message, are converted to the native protocol of the second network 28, but the upper levels (i.e., the session level, and perhaps the levels above the session level) are forwarded transparently. Accordingly, in the second network 28, customized service interpreters, shown as service interpreter A 30 and service interpreter B 32, as well as other interpreters associated with other protocols, must include service logic that is able to handle the service requests made by the different networks (in this case network 1). Accordingly, the different services that are available from the different networks (such as the network shown in Figure 1) must be managed by the second network 28, in a multiple-net context, such that the second network 28 must be able to handle a termination of multiple sessions and be capable of handling the variety of different signaling protocols. Accordingly, implementing the service interpreters A 30 and service interpreter B 32, so as to handle the different networks, becomes increasingly complex as more and more communication providers become active in the communication industry. This increase in software complexity becomes costly in the development phase, and increases the upgradability and expandability difficulties associated with making changes in each of the different networks, when new networks come on line. Accordingly, a technical problem as presently recognized, is to find a technology that allows for the development and use of software to handle

"multiple services", where the software is less complicated to develop, maintain, upgrade and expand than as is presently used in signaling gateways.

While Figure 2 shows a somewhat generic description of how gateway 24 is employed, consistent with the internet engineering task force (IETF) and the objects management group (ONG), solutions have been suggested to use the gateways for handling signaling system 7 (SS7) based signaling using the telecommunications network (e.g., the first network 20) to cooperate with the service logic in an internet protocol (IP) based network (such as the second network 28 in Figure 2). Thus, in the context of a SS7-net communicating with an IP-based net, requires that the signaling protocol for the SS7-signaling will in and of itself be carried forward by an IP-based carrier protocol, but that the service logic must ultimately be interpreted by the IP-based service logic.

SUMMARY OF THE INVENTION

Consistent with the title of the present section, specific attributes of the present invention are described herein. However, the section entitled Detailed Description of the Preferred Embodiments provides a more complete listing of the attributes of the present invention.

A goal of the present invention is to address the above-identified limitations with conventional systems and devices.

Another object of the present invention is to allow communication networks, such as telecommunication networks, to manage only their own protocols and for translation between protocols to occur within the transmission segment between different networks. Accordingly, an advantage of such a feature of the invention is that special arrangements in the different networks are not required for communicating between nets and thus it is easy to add additional component networks to the overall "network-of-networks" (i.e., the aggregate network).

Another object of the invention is to reduce system implementation costs by avoiding unique protocol translation programming in the different networks.

In order to address problems of conventional systems and the above-identified and other objects, a device and method according to the present invention is provided that simplifies a way of managing services in an aggregate network. Different sub-networks within the network employ net-dependent signaling protocols, and services that may be

performed in different sub-networks within the overall network, are executable and available in the various sub-networks. In order to handle the signaling protocol issues raised regarding how the services will be completed and how the signaling protocols will be handled, a signaling proxy mechanism is included within the aggregate network where the signaling proxy is placed in the transmission path from a first network to a second network. Between the first network and the signal proxy mechanism, the signal message is sent in a standard, joint-protocol. The signal proxy mechanism then interprets the signal message using a standard protocol interpreter, and then identifies the protocol employed by the second network. The signal proxy mechanism then assumes the burden of creating a communication session with the second network, and communicating with the second communication network, in the native protocol of that second communication network. The signaling proxy mechanism may also work in a reverse manner (i.e., handling service requests and signaling information passed from the second network to the first network).

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 is a diagram showing a conventional, evolutionary approach towards establishing communication links between existing communication networks;

Figure 2 is a conventional gateway-based interconnection between a first network and a second network that use different protocols;

Figure 3 is a block diagram of a signal proxy-based communication segment between a first network and a second network according to the present invention;

Figure 4 is a block diagram of components of signal proxy mechanism according to the present invention; and

Figure 5 is a flowchart showing a method employed by the present invention for communicating between different sub-networks.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and in particular to Figure 3, a first network 300 is shown to be linked to a second network 312, by way of a signal proxy mechanism 304. The signal proxy mechanism 304 includes a standard protocol interpreter 308 that is coupled to a net-adaptive translator 306. The standard protocol interpreter 308 receives a signal message 302 in a standard, joint-protocol as sent from the first communication network 300. The signal message 302 is prepared in a standard format, which may be any agreed upon protocol, includes information regarding a service requested in the second communication network 312. The signal message 302 is identified in Figure 3 as a block, which is indicative of the standard, joint-protocol. The standard protocol interpreter 308 handles the communication with the first network 300 in a communication session. The signal proxy mechanism 304 terminates the incoming signaling session between the first communication network and opens a completely new signaling session with a receiver located in the second network 312, possibly using a completely different protocol as indicated by the oval block for the signal message 310. The signaling information received by the signal proxy mechanism, is interpreted by the standard protocol interpreter 308, which maintains a status pattern that is separate from a corresponding outgoing session. The current status and information received on the incoming session with the first communication network 300, is used to control how the net-adaptive translator 306 prepares the message to be generated on the outgoing session with the second network 312. Moreover, the net-adaptive translator 306 prepares the signal message 310 in the native protocol of the second communication network, so that conventional service interpreters 314 contained within the second network 312 may readily receive and process the signal message 310 without requiring net-dependent protocols within the second network 312, as was the case with the second network 28 (Figure 2).

Accordingly, a result of the structure shown in Figure 3 is that a calling network, such as the first network 300, need only use the joint-protocol when sending a signal message to the signal proxy mechanism. Furthermore, the receiving network (the second network) need only be able to handle its own protocol, thus relying on the signal proxy mechanism to attend to a full translation between the different protocols employed by other networks in the aggregate network. Thus, the installation of only one extra protocol (the joint-protocol) is needed for the different nets. By using the signal proxy mechanism instead of the signaling gateways, the signaling proxies allow the use of the joint protocol on the calling end of the

communication link where the service logic is and the net-adapting protocol to the calling network. Accordingly, the software that is employed by the different networks, need only manage the joint protocol, other than the network's native protocol such that the program logic becomes less complicated and costly to develop and maintain. Furthermore, the expandability and adaptability of the aggregate network to handle new communication networks is easily achieved, and thus avoids a "barrier of entry" to the new services.

As a specific example, the present invention handles the question of addressing, when several net nodes and applications are present in order to close a link with a particular terminal or device which may be present in any one of the different networks. Instead of installing a specific address analysis mechanism for each domain/net type/protocol, one or multiple signal proxy mechanisms according to the present invention are installed in a respective domain/net. These signal proxy mechanisms are able to handle the addressing question on the incoming session and in turn able to generate an address question towards a joint address service via the joint protocol. Aspects of this portion of the overall system are described in co-pending application entitled "METHOD, SYSTEM AND DEVICE FOR ESTABLISHING COMMUNICATION BETWEEN DIFFERENT COMMUNICATION NETWORKS", previously discussed. Functionally, however, the addressing question may be handled by the signal proxy mechanism regarding handling number portability and "equal entry" into the telecommunication aggregate network, i.e., handling the intelligent network application protocol, INAP, and medium access protocol, MAP, protocols, data name questions (DNS) and user localization questions (session initiation protocol, SIP, lightweight directory assistance protocol, LDAP, etc.) on an IP-based net. Each of these questions can be directed toward the joint address service via the joint protocol. Accordingly, the present inventive method and system is able to handle information-based services and properties that are arrangeable via the joint protocol.

Figure 4 is a block diagram of the signal proxy mechanism 304. A system bus 351 interconnects a central processing unit (CPU) 353 which provides the processing infrastructure for a software implemented controller. The CPU 353 communicates over the system bus 351 with ROM 357 and RAM 355 which provide permanent and read/writeable memory capacity respectively. The ROM 357 is field-writeable such that changes in the application software for implementing the standard protocol interpreter 308 (Figure 3) are implemented. While the respective interpreter and translator shown in Figure 3 within the

signal proxy mechanism 304 are predominantly operated in software implemented on the CPU 353, processing resources may also be implemented using hardware implementations in the form of an application specific integrated circuit 359 and field programmable gate array 361, which also connect to the system bus 351. The database 37 resources for holding subscriber and net-specific in formation are hosted on mass storage medium 363 which may be magnetic memory, optical memory or the like. While a single CPU 35 is shown, other processors may also populate the system bus 351, and as an alternative embodiment a separate processor is dedicated for the information retrieval and searching operations for the database implemented on the mass storage medium 353. An input/output controller 365 connects to the system bus 351, as well as a protocol converter mechanism 367 and memory 369. The protocol converter 367 and memory 369 implement a portion of the router 39 net-adaptive translator 306 for assisting and facilitating the protocol translation operation. The I/O controller 365 governs information and message traffic between the signal proxy mechanism and external objects, in addition to communications with local peripherals 4.

Figure 5 is a flowchart of a process employed according to the present invention. The process begins in step S1 where a first network sends a message to the signaling proxy using a joint protocol. The process then proceeds to step S3, where the signaling proxy interprets the message and extracts the information therefrom in a calling session. The process then proceeds to step S3, where the second network (i.e., the network that is to perform the requested service) is identified. The process then proceeds to step S7, where the signaling proxy mechanism opens a new communication session between the signaling proxy mechanism and the called network. This session will include providing the signal information in a signal message to the second network using the native protocol of the second network. The process then proceeds to step S9, where the signal proxy mechanism terminates the session with the first network (i.e., the calling network). The process then proceeds to step S11 where the second network performs the requested service without having to further interpret any signaling protocols. The process then ends.

The mechanism and processes set forth in the present description may be implemented using a conventional general purpose microprocessor(s) programmed according to the teachings in the present specification, as will be appreciated to those skilled in the relevant arts. Appropriate software coding can readily be prepared by skilled programmers based on the teachings in the present disclosure, as will also be apparent to those skilled in

the relevant arts.

The present invention thus also includes a computer-based product that may be hosted on a storage medium and include instructions that can be used to program a computer to perform a process in accordance with the present invention. The storage medium may include, but is not limited to, any type of disk including floppy disk, optical disks, CD-ROMs, magneto-optical disks, ROMs, RAMs, EPROMs, EEPROMs, flash memory, magnetic or optical cards, or any type of media suitable for storing electronic instructions.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

The present document contains subject matter related to Swedish patent application no. 9901819-4, filed in Sweden on May 19, 1999, the contents of which being incorporated herein by reference.

Claims:

1. A communication device, comprising:

a joint protocol terminal configured to receive a signal message from a first network, said signal message being sent from said first network according to a joint protocol and containing information regarding a communication service to be performed by a second network, and

an output message formatting mechanism including a net-adaptive translator that reformats said signal message in a net-adaptive protocol for transmission to said second network, wherein

said net-adaptive protocol being used by terminals for communication within said second network.

2. The device according to Claim 1, wherein said joint protocol being used by a node in said first network, said node providing service logic.

3. The device according to Claim 1, wherein:

said net-adaptive translator being configured to select said net-adaptive protocol from a plurality of protocols, said net-adapted protocol being a native protocol of said second network.

4. The device according to Claim 1, wherein said signal proxy mechanism being configured to receive said signal message from said first network in an incoming signaling session and translate the information to a protocol that is identifiable for a receiver in a second network such that the information is translated in a manner that corresponds with the information transmitted from the first network.

5. The device according to Claim 1, wherein:

said signal proxy mechanism being configured to monitor a state of communication sessions involving said signal proxy mechanism and maintaining a status pattern for each session.

6. The device according to Claim 1, wherein:

information in a state of said signal message sent from said first network being interpreted by said signal proxy mechanism in a way to control a content of a corresponding outgoing message sent from said signal proxy mechanism to said second network.

7. A method for simplifying a management of services in a communication network, said communication network having a plurality of sub-networks that use different signal protocols, comprising steps of sending from a first sub-network a signal message in a predetermined protocol to a signal proxy mechanism;

identifying a second network from information contained in said signal message; and

sending an outgoing signal message to said second network in a signal protocol that is native to said second network so as to invoke a requested service be performed by said second network.

8. The method according to Claim 7, further comprising:

translating in said signal proxy mechanism the signal message into the native protocol.

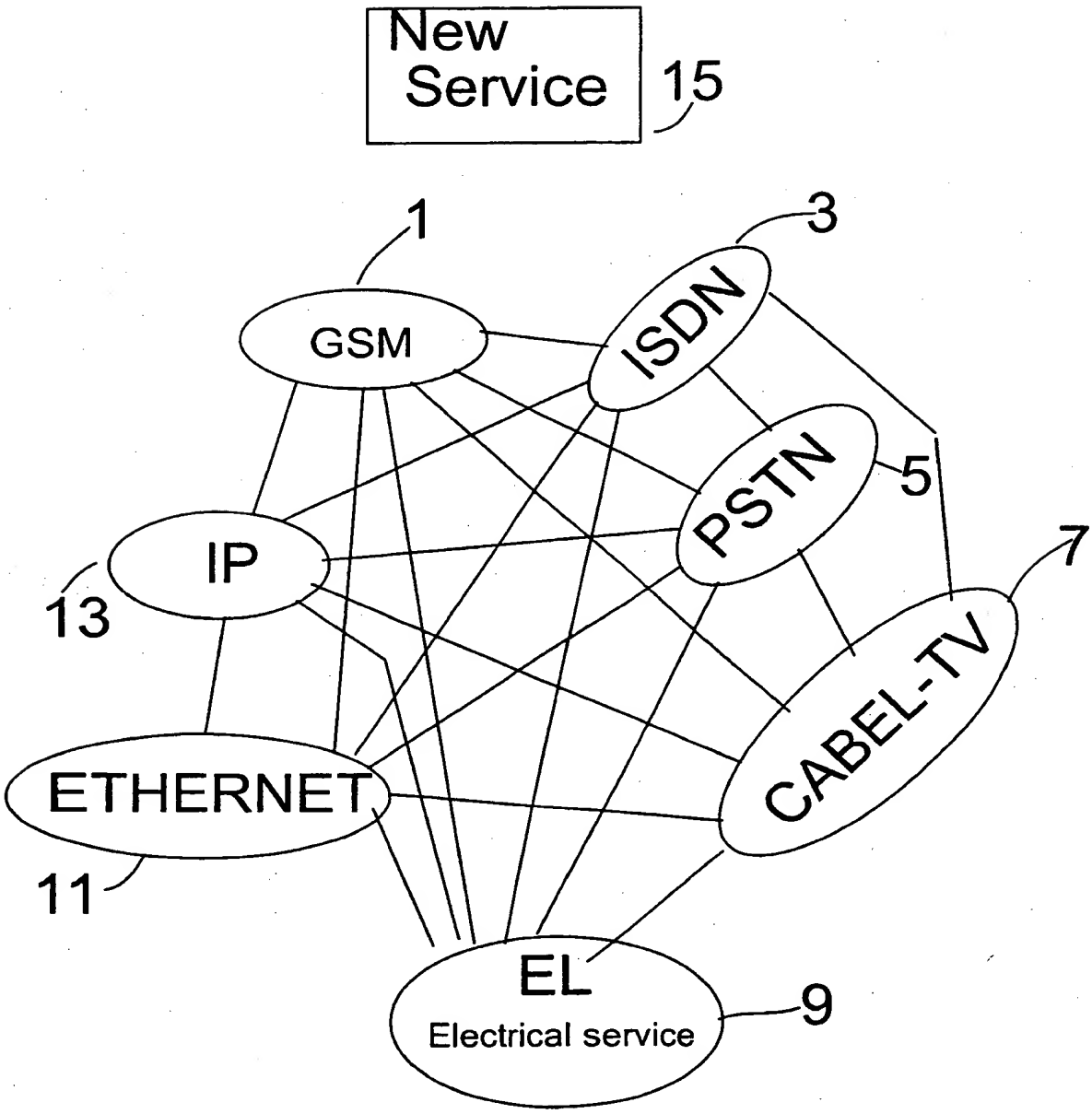
9. The method according to Claim 8, wherein:

said translating step includes translating said signal message into a format, such information contained in said format is directly extracted by a receiver and said second communication network without further translation.

10. The method according to Claim 7, further comprising managing at said signal proxy mechanism a plurality of simultaneous sessions with different sub-networks.

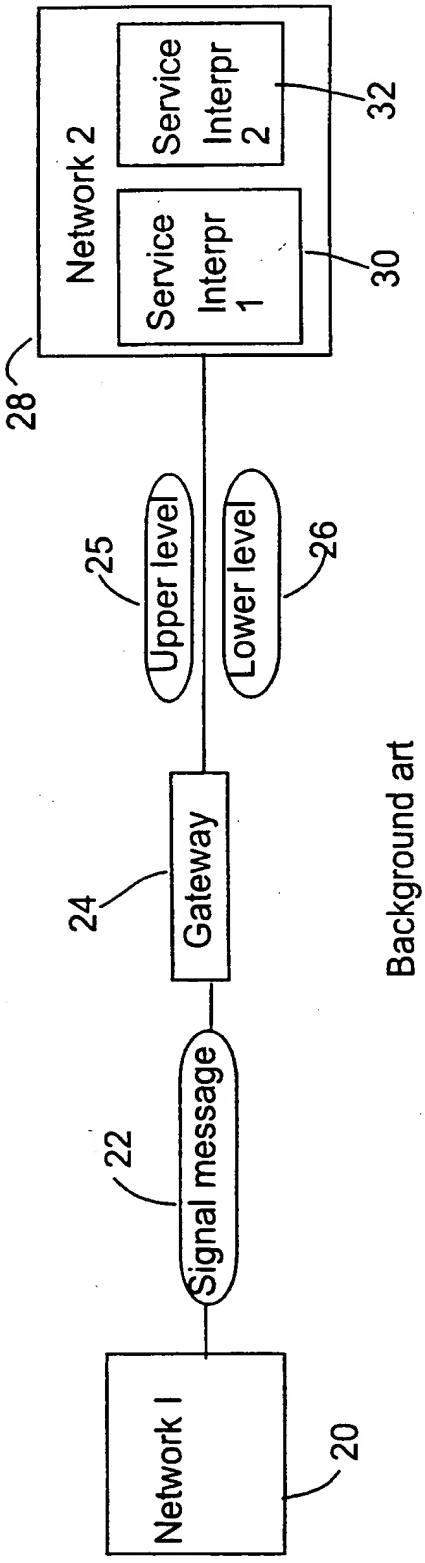
11. The method according to Claim 7, further comprising:

overseeing progressive sessions at said signal proxy mechanism and establishing a state pattern for each session.



Background art

Fig 1



Background art

Figure 2

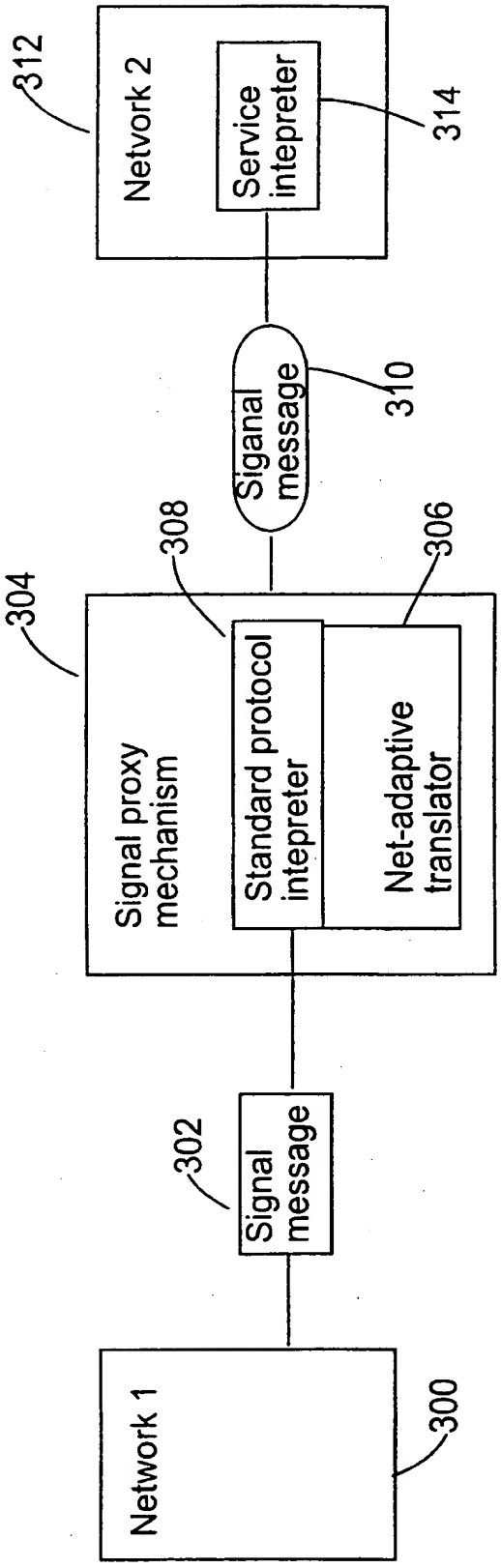


Figure 3

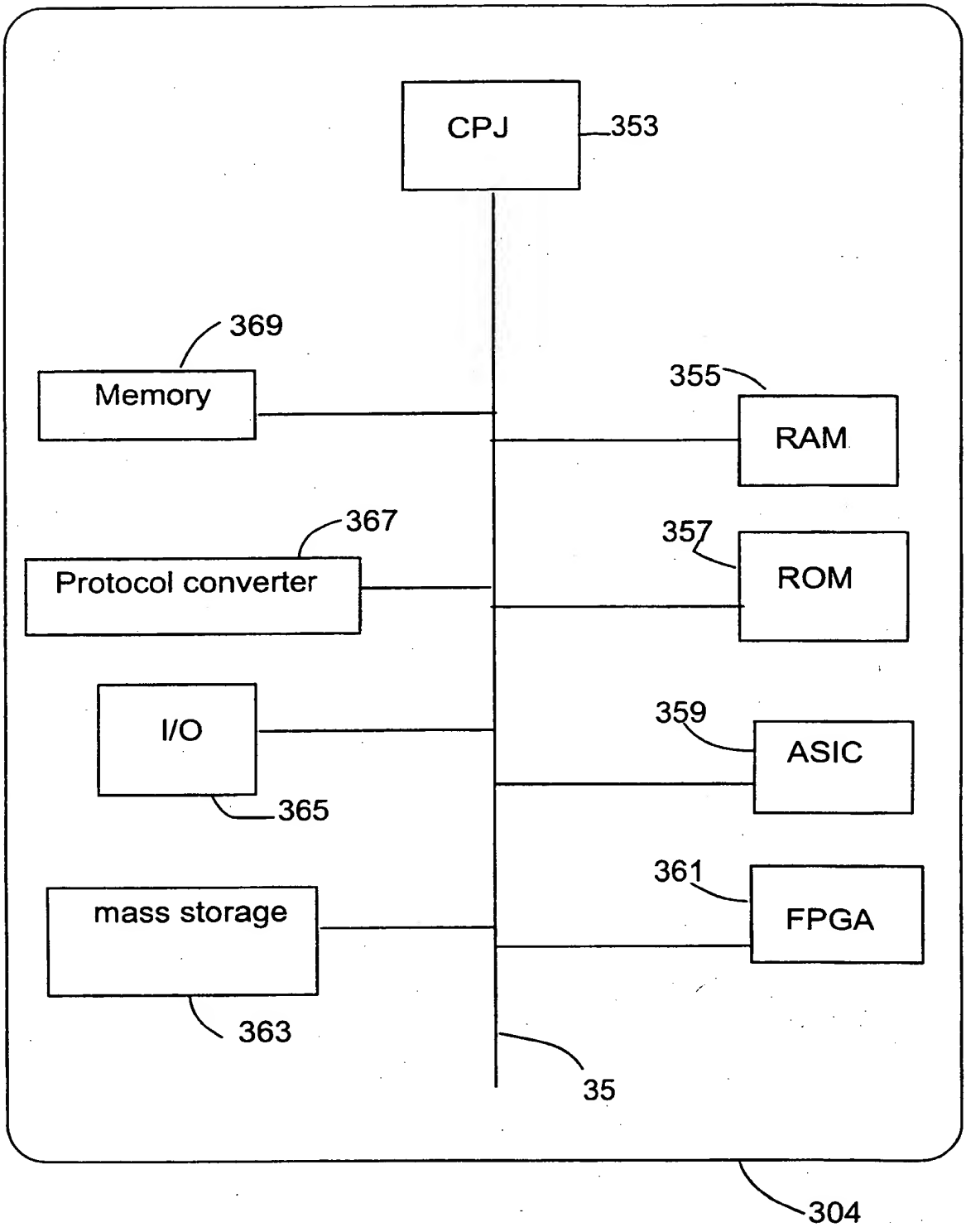

CPJ
353
369
Memory
355
RAM
367
Protocol converter
357
ROM
I/O
359
ASIC
365
361
mass storage
FPGA
363
35
304

Figure 4

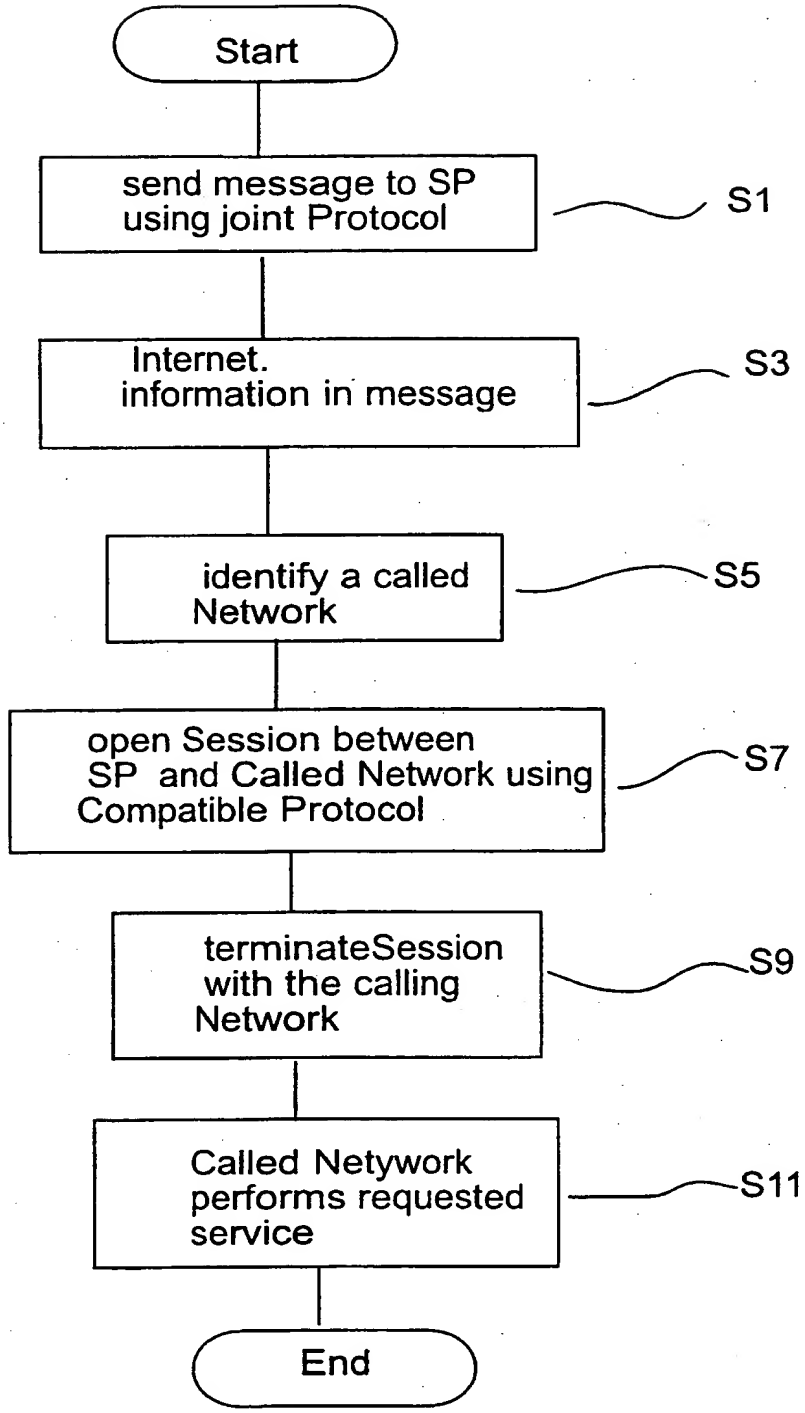


Fig 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00995

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/66, H04L 12/46
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5420916 A (SEKIGUCHI), 30 May 1995 (30.05.95), column 3, line 6 - column 4, line 8 --	1-11
A	WO 9744957 A1 (NYNEX SCIENCE & TECHNOLOGY INC.), 27 November 1997 (27.11.97), page 4, line 6 - page 5, line 15; page 7, line 12 - line 20; page 11, line 6 - line 21, page 14, lines 8-17, figure 2. --	1-11
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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